Studies on the Ultrafine Powders for Industrial Use by Means of Electron Microscope and Electron Diffraction

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Taking electron micrographs of various kinds of ultrafine powders for industrial use by the SM-T4, one of the electron microscopes of the new type, we investigated the correlation between the quality of the powders and those items, the size, the shape and the size distribution. The table shows the outline of the results.

samples	uses	mean dia. (μ)	shape
$CaCO_3$ S. Co. S-3	tooth powder, etc.	2.0	spindle shaped
〃 Caltex	paper grade filler	0.5	〃
〃 ultrafine	rubber grade filler	0.04	cubic
$MgCO_3$ K. Co. No. 1	〃	0.5	hexagonal, flat
〃 S. Co.	〃	0.5	〃
ZnO S. K. Co.	pigment	0.5	rodal
〃 ultrafine	〃	0.02	spherical
TiO_2	delustrant for viscose rayons	0.08	〃
Graphite "Aquadac"	heat durable friction reducer		amorphous
〃 "Graphosol"	〃		〃

Using the same sample as mentioned above (ultrafine $CaCO_3$), we prepared various sheets of enlarged electron micrographs which had various degrees of magnification, that is, 30,000, 48,000, 50,000 and 80,000, and obtained the size distribution curves with some three hundred particles in every sheet of these enlarged photographs. The shape of the curves were identical with each other, but when the degree of magnification was increased, the most probable value of the diameters of the particles was also increased.

The electron diffraction patterns of the $CaCO_3$ powders taken by the same apparatus showed that they had all "Calcite" structure and the 14 lines detected on the each pattern corresponded to the interplanarl distances extending over from 0.5 to 3 Å. It seems very convenient to use electron diffraction patterns for the identification of the powder material, and they are superior to X-ray diffraction patterns in the next few points.

1) The patterns are obtainable by a few seconds exposure, while X-ray patterns generally need at least few hours.

2) Because of the high resolving power, they give very sharp lines, even when the powders are very fine, while X-ray patterns show very broard and diffused lines.